

MUSCLES OF THE BACK.

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WERE any illustration needed to show how a single error in anatomy, once established and allowed to pass, rapidly produces other errors, until the description of that department of the animal frame to which it refers is reduced to a state of utter confusion, none better could be selected than the commonly received account of the muscles of the back, which renders almost unintelligible a region the simplest and the most typical in the whole body. I cannot refrain from expressing my surprise that such a scandal should be permitted to exist. The complicated muscular apparatus which moves the highly developed limbs in man is taught with a degree of tedious minuteness, without the proper reference in its relations to the firm yet moveable column of support, constituted by the succession of bony segments termed the vertebræ.

The cause of all this error lies in the glaring inaccuracies which are still, to our shame, interwoven with the description of the skeleton. Whilst the same name is applied to totally different parts of a vertebra, different names are applied to the same parts; and hence muscular fibres which extend from corresponding points of bone, pursuing a simply longitudinal course, are described with a multiplicity of terms, as most erratic, planless, and incomprehensible. With the present system of osteology, it is impossible to describe the simplest muscles of the body; and no one feels the least reluctance to confess that he knows nothing whatever of the "region of the back."

In addition to osteological errors, we

have to encounter the annoyance of a most arbitrary and faulty muscular nomenclature. It really seems a practical joke, that anatomists say, thus far shall be sacro-lumbalis, and thus far musculus accessorius ad sacro-lumbalem: thus far shall be semispinalis colli; thus far multifidus spinæ. Of late years we have had the re-introduction of some rotatores spinæ. Where are they, forsooth, if they owe not their being to the patience, ingenuity, and manipulation of the dissector? No candid person will hesitate to say that to make these muscles correspond with description he has invariably cut them into shape. For the better illustration of these parts as they are seen in man, let us take the skeleton of the common snake. It is composed of a series of moveable vertebræ, of which none are coalesced save the vertebræ of the head; all others play freely in a ball-and-socket joint, there being neither sacrum nor coccyx. These vertebræ are moved by the following muscles:—

1. *The spinalis dorsi* (Cuvier), arising from the lateral face of the spinous processes, and directed from before backwards, divides at its inner side into as many fasciculi as there are vertebræ, each fasciculus terminating in a long tendon contained in a tendinous sheath. The muscle then composed of tendinous and fleshy fibres, extends from vertebra to vertebra, attached to the most posterior of the bony levers of the column, namely, to the spinous processes.

2. *The longissimus dorsi* arises from "the extremity of the point of the an-

terior articulating process, corresponding with the transverse process" (Cuvier): in other words, with the diapophysial element of Owen. It is composed of tendinous and fleshy fibres, extending between these points of bone along the whole length of the vertebral column.

3. *The sacro-lumbalis* is composed of tendinous and fleshy slips, passing from the posterior border of the upper third of the ribs, (somewhat corresponding with the angle of the ribs in human anatomy) along the whole length of the vertebral column.

What, then, would be a summary of the preceding remarks? The posterior aspect of the vertebral column presents three prominent points of leverage arranged in longitudinal linear series on either side of the trunk. The central points are the apices of the spinous processes, which, as we know, are often bifid. External to these are the diapophyses. External to the diapophyses are the angles of the ribs.

From between these points of bone muscular and tendinous bands pass, constituting three longitudinal compound muscles — the *spinalis dorsi* (which comprises the *interspinalis*), the *longissimus dorsi*, and the *sacro-lumbalis*. They are all extensors of the spine, where the muscles act together upon both sides of the trunk. Where only one set acts, the spinal column is inclined to the corresponding side.

Under the preceding lies a layer of oblique muscular and tendinous fibres, passing from the transverse processes (diapophyses) to the spinous processes, the *semi-spinalis* or *transverso-spinalis* (Cuvier). Their action is to rotate the vertebræ upon one another.

Were I to state that in the human subject the muscles of the back might be dismissed in as summary a manner, there are many who, remembering the list of hard names with which that department of human anatomy is enriched, would feel disposed to withhold their belief. It can be readily proved, however, if one point be conceded; namely, that we adopt an accurate and scientific nomenclature of the elements of the vertebræ, instead of the faulty one now in use.

Let it be borne in mind that every vertebra is composed of a body or centre, around which, in its perfect form, are four canals; one, the vertebral groove for the spinal chord; a second,

represented by the ribs and the sternum, for the heart and great vessels; and two lateral canals for the vertebral arteries: any of the surfaces of bone, bounding these canals, may constitute a lever for muscular attachment. Confining our attention to the posterior surface of the vertebral column, we notice (1) the spinous processes; (2) the diapophyses (or transverso processes), but faintly marked in the cervical region: long and prominent in the dorsal region; known as the tubercles, or the apophysary elements (Cruveilhier) in the lumbar region, still more faintly marked in the sacral region; (3) the ribs, short and stunted in the cervical region, where they are hollowed or grooved to support the cervical nerves, as they emerge from the intervertebral foramina; long and moveable in the chest, where they form an osseous cavity, capable of rising and falling in respiration; short and fixed in the abdominal region, where (under the unhappy name of transverse processes, which confounds them with the dorsal diapophyses) they give origin to the *transversalis* muscle by well-marked fibrous ribs.

The mobility of the vertebræ, the inclination of the articulating processes, the length and direction of the bony levers, must all be remembered in the examination of the muscles of the back. Where five vertebræ coalesce to form a solid piece, the sacrum, a base of support to the column above it, the muscles attached to these bones, no longer needed, become blended together, and are regarded as constituting the origin of the muscular and tendinous slips, which, proceeding thence, pass upwards to the moveable vertebræ of the dorsal or cervical region. This is why we talk of the *longissimus dorsi* and the *sacro-lumbalis* arising from the sacrum and pelvis, and extending upwards to their respective insertions. Cuvier, in his description of the same muscles in the common snake (*Coluber natrix*), makes them arise at the head (the only part of the vertebral column where the vertebræ are coalesced) and extend downwards to the tail.

The more moveable the vertebræ one upon another, the thicker and more powerful are the muscles attached to them. Hence, in the lumbar region, the extensor muscles are strongest; in the neck the rotator muscles are strongest. In the dorsal region, where (from

the necessity of preserving a firm column of support, upon which the ribs may move,) scarce any extension is possible between the superior vertebræ, the interspinalis muscles are represented by ligamentous bands passing from the imbricated spinous processes; and the common extensor pulls upon them as upon a single piece. The oblique direction of the cervical articulating process allows of considerable rotation combined with extension: the tongue of bone, dipping down from the anterior inferior margin of the body of the cervical vertebra, presents flexion forwards. In a well-marked skeleton, the apex of the spinous process of the axis may be made in extreme extension to touch the apex of the seventh cervical vertebra, the intervening shorter spines radiating from the point of contact as from a centre. The articulating processes in the dorsal region allow of the lateral swaying movement of the trunk. Rotation is very limited, and extension of the vertebræ one upon the other is impossible in the upper part of the chest from the oblique imbricated direction of the spinous processes. At the junction of the lumbar and dorsal regions we have combined both the lateral swaying movement, and also flexion and extension, as is well illustrated by the springing movement in any of the active carnivorous quadrupeds. The mobility of the vertebral segments, which ceases at the sacrum, is in a slight degree resumed in the coccyx, which possesses the power through the coccygeus muscle of curving forwards to diminish the inferior outlet of the pelvis.

With these prefatory remarks I shall now pass to the anatomy of the muscles of the back, purposely rendering their description as concise as possible. The muscles first exposed upon the reflection of the integument of the back, belong to the upper extremity, which we are taught by homology to regard as the separated and displaced costal appendage of the occipital vertebra. The trapezius, highly developed, still retains at the upper extremity its attachment to the occipital spine. The levator anguli scapulæ and the serratus magnus, portions of the same muscle, extend from the ribs to the scapula; a bone, which although triangular and expanded for muscular attachment, is now recognised as a rib. The latissimus dorsi and the

two rhomboids arise from the spines of the vertebræ, and are inserted respectively into the humerus and the scapula. Were we to represent the muscular system of a vertebrate animal in its simplest form, it would be expressed as muscular and tendinous slips passing from contiguous vertebræ. Yet here we have the separated costa or rib of the occiput receiving muscular fibres from nearly the whole length of the vertebral column. The vertebral aponeurosis, which extends from the upper border of the serratus posticus inferior, under the serratus posticus superior, to the splenius muscle, bends down the proper muscles of the back.

They may be arranged in three layers: 1, oblique; 2, longitudinal; and 3, oblique.

1ST LAYER.—*Oblique*, from within upwards and outwards. The *splenius* muscle occupies the cervical region, where rotation is more free than in other parts of the trunk. It arises from the four or five upper dorsal, and the four or five lower cervical spines; the fibres pass upwards and outwards to be inserted into the posterior tubercles of the transverse processes of the three or four upper cervical vertebræ, into the mastoid process and into the superior curved ridge of the *occipital bone*, or, *homologically expressed*, into the diapophyses of the parietal and occipital, and three or four upper cervical vertebræ.

2ND LAYER.—*Longitudinal*, composed of three muscles: *interspinales*, *longissimus dorsi*, *sacro-lumbalis*.

The interspinales exist as well-marked muscles in the cervical and upper lumbar region: in the former they are arranged in pairs, the spinous processes being bifid. In the upper dorsal region they are represented by tendinous bands passing between the imbricated dorsal spines. In the lower lumbar region they cease to exist as muscles, the quadrilateral spines admitting no extension backwards. They cease in the sacrum, where the vertebræ coalesce to form a single piece, and they then become blended with the muscular and fibrous tissues covering the posterior surface of that bone. But at the junction of the lumbar and dorsal regions there exists an hypertrophy of the interspinales. At that point, where great freedom of movement is allowed by the different directions of the articulating processes, which look backwards and

forwards in the one, and inwards and outwards in the other region, a layer of muscular and tendinous fibres passes from spine to spine, known as the *spinalis dorsi*: it extends from the two or three upper lumbar spines, to the seven or eight lower dorsal spines.

I need hardly observe that the *recti capitis postici* are *interspinales* which, continued upwards, are prolonged over the vaulted and expanded cranial spines, as *occipito-frontalis* and *pyramidalis nasi*.

The blended sacral origin of the *longissimus dorsi* and the *sacro-lumbalis* is called the *erector spinæ*. The former extends from the diapophyses of the sacrum as far as the mastoid process of the temporal bone, under the names of *longissimus dorsi*, *transversalis colli*, and *trachelo-mastoid*. I would confine to this muscle the name of *longissimus dorsi*, and allow the two last terms to be forgotten; for it is impossible to dissect the superior portions as perfectly distinct muscles. Its tendinous insertions are numerous: a depending process from the tubercles or diapophyses of the four upper lumbar vertebræ receives as many short tendinous slips; stronger tendons are attached to each of the dorsal diapophyses. and the cervical vertebræ receive tendons at the same points, which, however, are less clearly marked in man, from the early coalescence of the cervical rib, short, stunted, and hollowed to support the cervical nerves as they emerge from the intervertebral foramina. The mastoid process receives the last slip, which we know under the name of *trachelo-mastoid*.

The outer layer is known by the three names of *sacro-lumbalis*, *musculus accessorius*, and *cervicalis ascendens*. The two last names I would not retain. The name *sacro-lumbalis* is inappropriate, as the muscle arises from the ilium and is inserted into the ribs.

Let it, then, be named *ilio-costalis*. Arising from the posterior fifth of the crest of the ilium, from a space corresponding with the attachment of the *gluteus maximus*, (that great muscle which extends the pelvis to maintain man in the erect posture,) it is inserted into the four upper abdominal ribs, all the dorsal ribs near their angles, and into all the cervical as high as the third vertebra. A slip is sometimes continued to the axis.

The *interspinales* then pass from spine to spine; the *longissimus dorsi* muscles from diapophysis to diapophysis; the *ilio-costales* from rib to rib, along the whole length of the vertebral column. Under the preceding, and nearer the arches and laminae of the vertebræ, extends obliquely a group of muscular and tendinous fibres from the diapophyses to the spinæ. These muscles are described under the names of *semi-spinalis dorsi*, *semi-spinalis colli*, *multifidus spinæ*, *rotatores spinæ*, and *complexus*. I would include them all under the name of *obliqui spinæ* or *rotatores spinæ*, as distinguished from the *erectores spinæ*. There does not appear to me to be any sufficient reason why an attempt should be made to separate the *semi-spinales* muscles from the *multifidus spinæ*, further than that the whole layer of oblique muscular and tendinous fibres admits of a more ready separation, by the aid of the knife, into a superficial and a deep set in those situations where the vertebræ move most readily one upon another, and where rotation is, consequently, most freely performed. The same remark applies to the so-called *rotatores spinæ*, which are nothing more than the deepest oblique fibres passing from contiguous vertebræ.

The *complexus* is in man separated at its insertion from the rest of this oblique group, in consequence of the great expansion of the occipital bone, which receives the posterior segments of the *encephalon*. It arises from the diapophyses of the four or five upper dorsal and four or five lower cervical vertebræ, and is inserted into the occipital spine between the superior and the inferior curved lines. Its origin and insertion proclaim it a part of the oblique layer.

The *obliqui capitis superior* belongs to this group. The *obliquus capitis inferior* is a special muscle oblique in the opposite direction, namely, upwards and outwards.

The *intertransversales* muscles exist only in the neck and in the lumbar region. They seem to me, from their attachments, to represent the *intercostales*, being intimately connected both with the *scaleni* and with the *quadratus lumborum*, and being described as *absent* in the dorsal region, their relationship with the dorsal intercostal muscles not having been recognized.

In recapitulation: The muscles of the

back are either oblique or longitudinal, and may be arranged in the following layers:—

1. Under the vertebral aponeurosis, and under the two serrati, is seen the splenius muscle, the fibres of which extend obliquely upwards and outwards, from the four upper dorsal and the four lower cervical spines to the diapophyses of the parietal, occipital, and four upper cervical vertebrae.

2. We see three longitudinal muscles:—(a) The interspinales, passing from spine to spine. (b.) The longissimus dorsi, passing from diapophysis to diapophysis. (c.) The ilio-costalis passing from rib to rib.

3. Nearer the vertebral column is a group of muscular fibres, passing obliquely upwards and inwards from diapophysis to spine, which may be comprised under the one head of obliqui or rotatores spinæ, the complexus being only the upper portions separated at its insertion in conse-

quence of the expansion of the occipital spine, and the great mobility of the head.

There are many interesting points of detail connected with these muscles which I have purposely avoided; my object being to show the general plan upon which they are constructed and arranged. Any apparent deviations from their typical simplicity have reference to their bulk, and not to their points of bony attachment, which remain the same under all circumstances; and such irregularities may be studied in different animals with great advantage, in connection with the shape of the vertebrae, and the direction of the articulating surfaces as pointing out the particular movements which are most readily performed in the different regions of the vertebral column.*

* Since writing the above, I have observed that Dr. Edward D'Alton adopts the name ilio-costalis for sacro-lumbalis, in his work on Human Anatomy.

